UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/842,694	04/27/2001	Isao Kobayashi	35.C13077 DI	9229

5514 7590 06/15/2004

FITZPATRICK CELLA HARPER & SCINTO
30 ROCKEFELLER PLAZA
NEW YORK, NY 10112

EXAMINER	
MONDT, JOHANNES P	

ART UNIT	PAPER NUMBER
2826	

DATE MAILED: 06/15/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/842,694	KOBAYASHI ET AL.	
	Examiner	Art Unit	
	Johannes P Mondt	2826	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *05 April 2004*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-3 and 7-11* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-3 and 7-11* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

Amendment filed 4/5/2004 forms the basis of this Office Action. In said Amendment Applicant substantially amended all independent claims 1 and 8. Comments on Remarks in said Amendment are included below under "Response to Arguments".

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. ***Claims 1-3 and 9*** are rejected under 35 U.S.C. 103(a) as being unpatentable over Endo et al (Doc. Id. No.: 09-098970; Japanese Patent No.: JP409098970A) in view of Umibe et al (Japanese Patent Application Number 06-313392; Application No.: 08-116044) and Takeda (5,591,963). Endo et al teach (cf. Drawing 6) a photoelectric converter (cf. title and abstract) of a laminated structure (laminated regions 602, 607, 604, 605 and 606 are laminated) comprising:

a first electrode layer 602 (G) (cf. section [0050], line 3);

an insulation layer 607 (cf. section [0053], lines 5-6) inherently blocking the passage of electrons and holes;

a photoelectric conversion semiconductor layer 604 (cf. section [0050], lines 5-9);

an injection blocking layer 605 for blocking the injection of holes only (inherently so for this n-type semiconductor layer; cf. section [0050], lines 5-9) to the semiconductor photoelectric conversion layer at a time;

a second electrode layer 606 (D) (cf. section [0050], lines 5-9); and

a switching means for operating the photoelectric converter by switching through operation modes including:

(a) a photoelectric conversion mode (cf. Drawing 6(b)) for emitting electrons produced by the photon-induced electron-hole pair creation and thus accumulating holes in accordance with an amount of incident light (cf. section [0053], lines 1-17);

(b) a refresh mode (cf. Drawing 6(a)) for emitting the other of the electrons or holes, namely the holes, from the photoelectric conversion element (cf. section [0052], lines 1-4).

Although Endo et al do not specifically teach to distinguish an idling mode for emitting electrons, hence the same of the electrons or holes as emitted by the photoelectric conversion mode, from the photoelectric conversion element, it would have been obvious to include said idling mode in view of Umibe et al, who teach the inclusion of an accumulation mode whereby the G electrode becomes open with regard to direct current, thus allowing any electrons created due to incidence of light to be accumulated as a charge on a capacitor (cf. Drawing 8 and section [0051].

Motivation, for including the teaching by Umibe et al in the invention by Endo et al, stems from the improved signal-to-noise (N/S) ratio (cf. section [0053]). *Combination* of said teaching with said invention is straightforward by including the open position for

said G electrode. *Success* in the implementation of said combination can therefore be reasonably expected.

The further limitation that said photoelectric conversion mode emits one of the holes or the electrons, whichever one is emitted in the idling mode, generated in accordance with an amount of incident light and for reading image information is not necessarily taught by either references. *Neither is the similarly functional limitation* that said idling mode is not for reading the image information.

Both limitations only define intended use. However, a recitation of the intended use of the claimed invention must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim while in a claim drawn to a process of making, the intended use must result in a manipulative difference as compared to the prior art. See *In re Casey*, 152 USPQ 235 (CCPA 1967) and *In re Otto*, 136 USPQ 458, 459 (CCPA 1963).

Neither Endo et al not Umibe et al necessarily teach the further limitation "by connecting a switching element and an idle terminal connected to a power source for applying an electric field weaker than an electric field applied in the photoelectric conversion mode", as newly introduced in claim 1, although inherently both the switching element and the idle terminal must exist and be connected to a power source in order to function. However, it would have been obvious to include said further limitation ("for applying an electric field weaker than an electric field applied in the photoelectric conversion mode" in view of Takeda et al, who teach that recombination

as required for refresh mode is too rapid unless V_{UB} reaches a sufficiently large and positive value, upon which a photoelectric current can be detected, which is the essence of the photoelectric conversion mode (cf. column 10, lines 23-28); hence the potential difference between first and second electrode layers is smaller during the idling mode than during the photoelectric conversion mode. But the electric field is the electrostatic potential's spatial gradient, while the spatial separation between the first and second electrodes is invariant. Therefore, it follows in Takeda et al that the electric field in the idling mode is weaker than in the photoelectric conversion mode.

With regard to *motivation*, it would have been obvious to include the teaching of Takeda et al because a minimum detection voltage is required for providing enough acceleration to the charge carriers created in the central intrinsic portion of the device. Combination, of the teaching by Takeda et al and the invention by Endo et al and Umibe et al, is straightforward by appropriate setting of the detection and idling voltage values.

On claim 2: with reference to the discussion above, Takeda et al who teach that recombination as required for refresh mode is too rapid unless V_{UB} reaches a sufficiently large and positive value, upon which a photoelectric current can be detected, which is the essence of the photoelectric conversion mode (cf. column 10, lines 23-28).

With regard to motivation, it would have been obvious to include the teaching of Takeda et al because a minimum detection voltage is required for providing enough acceleration to the charge carriers created in the central intrinsic portion of the device. Combination, of the teaching by Takeda et al and the invention by Endo et al and Umibe et al, is straightforward by appropriate setting of the detection and idling voltage values.

On claim 3: in the directions for operation as taught by Takeda et al operation with V_{UB} small but >0 (idling mode) is preceded in Takeda et al by operation with V_{UB}=0 (refresh mode) (cf. column 11, lines 60-65). Furthermore, irregardless of this teaching, it is generally understood by those of ordinary skills in the art that when common voltage regulators are used the transition from zero to a specific minimum positive voltage necessarily involves ramping up the voltage from zero to said minimum positive voltage, from which the further limitation as defined by claim 3 follows. Therefore, claim 3 does not distinguish over the prior art.

On claim 9: the potential V_{UB} in Takeda et al, which corresponds to the potential V_{dg} as defined by Applicant, can adopt zero, positive and negative values (cf. column 9, line 58 – column 10, line 2), which is understood by those of ordinary skills in the art to be a standard option in circuitry. Therefore, the further limitation as defined by claim 9 does not distinguish over the prior art.

3. ***Claim 7** is rejected* under 35 U.S.C. 103(a) as being unpatentable over Endo et al, Umibe et al and Takeda et al as applied to claim 1, and further in view of Furukawa et al (5,591,960) and Arita (4,740,710). As detailed above, claim 1 is unpatentable over Endo et al in view of Umibe et al and Takeda et al.

Endo et al neither Umibe et al nor Takeda et al do not specifically teach the application of the photoelectric converter such that a plurality of said photoelectric elements are arranged one-dimensionally or two-dimensionally with a switching element connected for each of the photoelectric conversion elements according to the further limitation of claim 7. *However*, one- and two-dimensional arrays of photoelectric

elements of this kind have long been known in the art of photoelectric converter systems, as witnessed by Furukawa et al, who teach a structure consisting of a combination of pluralities of photoelectric element array sections *for the purpose of obtaining a high level signal with low noise* (cf. column 4, lines 48-55) comprising a plurality of photoelectric conversion elements, arranged two-dimensionally (cf. column 6, lines 33-37) with a switching element connected for each of the photoelectric conversion elements (cf. column 6, lines 49-56) with all the photoelectric conversion elements being divided into a plurality of n blocs (n=3, the blocks being circuit sections 1002/1102, 2002/2102, and 4002/4102; cf. column 6, lines 49-59), a light signal of all the n x m photoelectric conversion elements (m being the number of photoelectric elements in each block; undefined in claim!) divided into n=3 blocks is output (inherent in any useful application of pluralities of photoelectric converters is their output) an intersection part of the matrix wiring, which when using the photoelectric converter essentially taught by Endo et al in view of Umibe et al comprises a laminated structure in which at least a first electrode layer, an insulating layer, a semiconductor layer and a second electrode layer are provided in this order. Furukawa et al do not necessarily teach that each layer of the laminated structure should be formed as prescribed by the further limitation of claim 7. However, *from a cost production point of view* it makes utter sense to form each said layer in this manner, because of ease of mass production; while Arita indeed teaches a photoelectric reading apparatus wherein a plurality of switches are each connected with one end of each of the photoelectric elements (diodes) (cf. column 7, lines 25-32 and Fig. 6). The teaching by Furukawa et al can be

easily combined with the invention by Endo et al and Umibe et al, because creating arrays of photoelectric converters has long been considered standard in the art of photoelectric conversion apparatus, while *motivation* to include the teaching by Furukawa et al and Arita in the invention essentially taught by Endo et al and Umibe et al is prompted by the obvious advantage of high S/N ratio as obtained through including the teaching by Furukawa et al, and, furthermore, the obvious advantage of lower manufacturing cost as obtained through including the teaching by Arita.

It thus would have been obvious to one of ordinary skills in the art to modify the invention at the time it was made so as to include the further limitation of claim 7.

4. ***Claim 8*** is rejected under 35 U.S.C. 103(a) as being unpatentable over Endo et al (Doc. Identification No.: 09-098970) in view of Umibe et al (Japanese Patent Application No. 06-313392), Takeda et al (5,591,963) and Perez-Mendez (5,596,198), or, in the alternative, in view of Umibe et al (loc. cit.), Takeda (5,591,963) and Sashin (4,179,100). Endo et al teach (cf. Drawing 6) a photoelectric converter (cf. title and abstract) of a laminated structure (laminated regions 602, 607, 604, 605 and 606 are laminated) comprising:

a first electrode layer 602 (G) (cf. section [0050], line 3);

an insulation layer 607 (cf. section [0053], lines 5-6) inherently blocking the passage of electrons and holes;

a photoelectric conversion semiconductor layer 604 (cf. section [0050], lines 5-9);

an injection blocking layer 605 for blocking the injection of holes only (inherently so for this n-type semiconductor layer; cf. section [0050], lines 5-9) to the semiconductor photoelectric conversion layer at a time;

a second electrode layer 606 (D) (cf. section [0050], lines 5-9); and

a switching means for operating the photoelectric converter by switching through operation modes including:

(a) a photoelectric conversion mode (cf. Drawing 6(b)) emitting electrons in accordance with an amount of incident light (cf. section [0053], lines 1-17);

(b) a refresh mode (cf. Drawing 6(a)) for emitting holes, i.e., the other of the two types (electrons, holes) from the photoelectric conversion element (cf. section [0052], lines 1-4).

Endo et al do not specifically teach to include an idling mode for emitting electrons, i.e., the same charge carrier type as in the photoelectric conversion mode, from the photoelectric conversion element. However, it would have been obvious to include an idling mode in the invention by Endo et al in view of Umibe et al, who teach the inclusion of an accumulation mode whereby the G electrode becomes open with regard to direct current, thus allowing any electrons created due to incidence of light to be accumulated as a charge on a capacitor (cf. Drawing 8 and section [0051]).

Motivation, for including the teaching by Umibe et al in the invention by Endo et al, stems from the improved signal-to-noise (N/S) ratio (cf. section [0053]). *Combination* of said teaching with said invention is straightforward by including the open position for

said G electrode. *Success* in the implementation of said combination can therefore be reasonably expected.

Neither Endo et al not Umibe et al necessarily teach the further limitation "by connecting a switching element and an idle terminal connected to a power source for applying an electric field weaker than an electric field applied in the photoelectric conversion mode", as newly introduced in claim 1, although inherently both the switching element and the idle terminal must exist and be connected to a power source in order to function. However, it would have been obvious to include said further limitation ("for applying an electric field weaker than an electric field applied in the photoelectric conversion mode" in view of Takeda et al, who teach that recombination as required for refresh mode is too rapid unless V_{UB} reaches a sufficiently large and positive value, upon which a photoelectric current can be detected, which is the essence of the photoelectric conversion mode (cf. column 10, lines 23-28); hence the potential difference between first and second electrode layers is smaller during the idling mode than during the photoelectric conversion mode. But the electric field is the electrostatic potential's spatial gradient, while the spatial separation between the first and second electrodes is invariant. Therefore, it follows in Takeda et al that the electric field in the idling mode is weaker than in the photoelectric conversion mode.

With regard to *motivation*, it would have been obvious to include the teaching of Takeda et al because a minimum detection voltage is required for providing enough acceleration to the charge carriers created in the central intrinsic portion of the device.

Combination, of the teaching by Takeda et al and the invention by Endo et al and Umibe et al, is straightforward by appropriate setting of the detection and idling voltage values.

Endo et al nor Umibe et al nor Takeda et al necessarily teach the photoelectric converter to comprise a signal processing means, display means, electric transmission means and radiation source as further defined by claim 8.

However, the use of signal processing for the purpose of generating corresponding image signals to various peripherals, signal recording for video/data recorder use, signal display for interactive video display are standard in the art of photoelectric imaging, as shown for instance by Perez-Mendez (cf. column 6, lines 28-36). Alternatively, the use of signal processing for the purpose of generating corresponding image signals to various peripherals, signal recording for video/data recorder use, signal display for interactive video display are standard in the art of photoelectric imaging, as shown by Sashin (4,179,100) (cf. Fig. 23 and column 15, line 64 – column 65, line 15). The examiner takes official notice that the use of electrical transmission for the transmission of data to other locations for remote processing or analysis is standard in the field. Finally, any photoelectric converter needs a radiation source for photon input, hence this aspect is inherent in a photoelectric converter system. Finally, any photoelectric converter needs a radiation source for input, hence this aspect is inherent in a photoelectric converter system.

The further limitation that said photoelectric conversion mode emits one of the holes or the electrons, whichever one is emitted in the idling mode, generated in accordance with an amount of incident light and for reading image information is not

necessarily taught by either references. *Neither is the similarly functional limitation* that said idling mode is not for reading the image information.

Both limitations only define intended use. However, a recitation of the intended use of the claimed invention must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim while in a claim drawn to a process of making, the intended use must result in a manipulative difference as compared to the prior art. See *In re Casey*, 152 USPQ 235 (CCPA 1967) and *In re Otto*, 136 USPQ 458, 459 (CCPA 1963).

5. ***Claim 10*** *is rejected* under 35 U.S.C. 103(a) as being unpatentable over Endo in view of Umibe et al, Takeda et al and Perez-Mendez, or, in the alternative, in view of Umibe et al, Takeda et al and Sashin et al as applied claim 8 above, and further in view of Takeuchi et al (JP363250634A; no images available on the PTO Data Base). As detailed above, claim 8 is unpatentable over Endo et al in view of Umibe et al and Perez-Mendez, or, in the alternative, over in view of Umibe et al and Sashin et al, none of whom, however, necessarily teach the use of phosphorus as a converter of wavelength of radiation as input into a photoelectric conversion element has long been known in the art as witnessed for instance by Japanese Patent to Takeuchi et al, who teach the conversion of X-rays to light in the visible range through the use of phosphorus prior to undergoing photoelectric conversion (cf. abstract and constitution), for the purpose of making it easier to read X-ray images through said conversion.

Motivation to include this teaching by Takeuchi et al is to reduce cost by making the system more easily operable (it is understood in the art that the radiation to be investigated for the case for which the invention by Takeuchi et al is intended, i.e., X-rays, is potentially a health risk). The teaching in this regard by Takeuchi et al can be easily *combined* with the invention of claim 8 through inclusion of a phosphorous or phosphorescent layer, which is standard in the light detection art. *Success* in combining the inventions can therefore be *reasonably expected.*

6. ***Claim 11*** is rejected under 35 U.S.C. 103(a) as being unpatentable over Endo et al, Umibe et al and Takeda et al as applied above to claim 1, and further in view of Hikiji et al (JP406029510A). As detailed above, claim 1 is unpatentable over Endo et al in view of Umibe et al.

Neither Endo et al nor Umibe et al noir Takeda et al necessarily teach the further limitation as defined by claim 11. However, TFT-driven photoelectric converters have long been known in the art of semiconductor image sensors, as witnessed for example by Hikiji et al, who teach the TFT-driven photoelectric converter (image sensor) to be made on the same substrate and with the same layer construction (cf. English Abstract, "Purpose", lines 1-4 and "Constitution", lines 1-7), thus increasing the compactness of the device. *Motivation,* to include the teaching by Hikiji et al, stems from the synergistic inclusion of the driver in the detector. *Combinability* is evident from the description of the formation of the TFT by Hikiji et al (see Abstract, "Constitution"). *Success* in implementing the combination can therefore be reasonably expected.

Response to Arguments

1. Applicant's arguments filed 4/5/2004 have been fully considered but they are not persuasive. In particular, Applicant's first point of traverse on page 9, that "nothing in this section or any other section of the specification would teach or suggest a relation of electric fields between an electric field applied in the idling mode and an electric field applied in the photoelectric conversion mode as recited in claim 1" appears oblivious of the circumstance that (a) said traverse is based on a newly introduced limitation per Amendment of 4/5/2004, and that said newly introduced limitation is both implied by and equivalent to the further limitation as defined by claim 2, because the electric potential difference of claim 2 is in one-to-one (linear) relation with the electric field strength, in view of E =-grad V. Applicant's second point of traverse (claim 8) solely relies on the same point of traverse, and hence is obvious for the same reason. No specific point of traverse was made concerning the key issue at hand in the examination of the newly introduced amendment to either claim 1 or claim 8, namely a possible traverse of the rejection of claim 2. For these reasons the examiner has no other option but to essentially maintain the rejections, albeit adapted to the newly introduced limitations to claims 1 and 8.

Conclusion

2. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP

§ 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Johannes P Mondt whose telephone number is 571-272-1919. The examiner can normally be reached on 8:00 - 18:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nathan J Flynn can be reached on 571-272-1915. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

NATHAN J. FLYNN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800

JPM
June 13, 2004